

FORM PTO-1390 (Modified) (REV 11-2000)		U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE		ATTORNEY'S DOCKET NUMBER <b>219200US2PCT</b>	
<b>TRANSMITTAL LETTER TO THE UNITED STATES</b> <b>DESIGNATED/ELECTED OFFICE (DO/EO/US)</b> <b>CONCERNING A FILING UNDER 35 U.S.C. 371</b>				U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR) <b>10/089106</b>	
INTERNATIONAL APPLICATION NO. <b>PCT/JP00/06712</b>		INTERNATIONAL FILING DATE <b>28 September 2000</b>		PRIORITY DATE CLAIMED <b>30 September 1999</b>	
TITLE OF INVENTION <b>SYSTEM FOR DESIGNING VISUAL INFORMATION ON A MONITOR UNIT UTILIZED IN COMBINATION WITH A PROGRAMMABLE LOGIC CONTROLLER</b>					
APPLICANT(S) FOR DO/EO/US <b>KOIKE Sadamitsu et al.</b>					
Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information: <ol style="list-style-type: none"> <li>1. <input checked="" type="checkbox"/> This is a <b>FIRST</b> submission of items concerning a filing under 35 U.S.C. 371.</li> <li>2. <input type="checkbox"/> This is a <b>SECOND</b> or <b>SUBSEQUENT</b> submission of items concerning a filing under 35 U.S.C. 371.</li> <li>3. <input checked="" type="checkbox"/> This is an express request to begin national examination procedures (35 U.S.C. 371(f)). The submission must include items (5), (6), (9) and (24) indicated below.</li> <li>4. <input checked="" type="checkbox"/> The US has been elected by the expiration of 19 months from the priority date (Article 31)</li> <li>5. <input checked="" type="checkbox"/> A copy of the International Application as filed (35 U.S.C. 371 (c) (2))             <ol style="list-style-type: none"> <li>a. <input type="checkbox"/> is attached hereto (required only if not communicated by the International Bureau).</li> <li>b. <input checked="" type="checkbox"/> has been communicated by the International Bureau</li> <li>c. <input type="checkbox"/> is not required, as the application was filed in the United States Receiving Office (RO/US)</li> </ol> </li> <li>6. <input checked="" type="checkbox"/> An English language translation of the International Application as filed (35 U.S.C. 371(c)(2)).             <ol style="list-style-type: none"> <li>a. <input checked="" type="checkbox"/> is attached hereto</li> <li>b. <input type="checkbox"/> has been previously submitted under 35 U.S.C. 154(d)(4).</li> </ol> </li> <li>7. <input checked="" type="checkbox"/> Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371 (c)(3))             <ol style="list-style-type: none"> <li>a. <input type="checkbox"/> are attached hereto (required only if not communicated by the International Bureau).</li> <li>b. <input type="checkbox"/> have been communicated by the International Bureau.</li> <li>c. <input type="checkbox"/> have not been made, however, the time limit for making such amendments has NOT expired.</li> <li>d. <input checked="" type="checkbox"/> have not been made and will not be made.</li> </ol> </li> <li>8. <input type="checkbox"/> An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).</li> <li>9. <input checked="" type="checkbox"/> An oath or declaration of the inventor(s) (35 U.S.C. 371 (c)(4))</li> <li>10. <input checked="" type="checkbox"/> An English language translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371 (c)(5)).</li> <li>11. <input type="checkbox"/> A copy of the International Preliminary Examination Report (PCT/IPEA/409).</li> <li>12. <input checked="" type="checkbox"/> A copy of the International Search Report (PCT/ISA/210).</li> </ol> <p><b>Items 13 to 20 below concern document(s) or information included:</b></p> <ol style="list-style-type: none"> <li>13. <input checked="" type="checkbox"/> An Information Disclosure Statement under 37 CFR 1.97 and 1.98.</li> <li>14. <input type="checkbox"/> An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.</li> <li>15. <input type="checkbox"/> A <b>FIRST</b> preliminary amendment</li> <li>16. <input type="checkbox"/> A <b>SECOND</b> or <b>SUBSEQUENT</b> preliminary amendment</li> <li>17. <input type="checkbox"/> A substitute specification.</li> <li>18. <input type="checkbox"/> A change of power of attorney and/or address letter.</li> <li>19. <input type="checkbox"/> A computer-readable form of the sequence listing in accordance with PCT Rule 13ter.2 and 35 U.S.C. 1.821 - 1.825</li> <li>20. <input type="checkbox"/> A second copy of the published international application under 35 U.S.C. 154(d)(4).</li> <li>21. <input type="checkbox"/> A second copy of the English language translation of the international application under 35 U.S.C. 154(d)(4).</li> <li>22. <input type="checkbox"/> Certificate of Mailing by Express Mail</li> <li>23. <input checked="" type="checkbox"/> Other items or information:</li> </ol> <p style="margin-left: 20px;"> <b>PCT/IB/304</b>  <b>Request for Priority</b>  <b>Form PTO-1449</b>  <b>Drawings (5 sheets)/ Amended Sheets (Pages 14, 15, 16, 17 and 17a)</b> </p>					

U.S. APPLICATION NO. (IF KNOWN) <b>SEE 37 CFR 1.53</b> <div style="font-size: 24pt; font-weight: bold; text-align: center;">10/089106</div>		INTERNATIONAL APPLICATION NO. <div style="font-weight: bold; text-align: center;">PCT/JP00/06712</div>		ATTORNEY'S DOCKET NUMBER <div style="font-weight: bold; text-align: center;">219200US2PCT</div>	
24. The following fees are submitted: <b>BASIC NATIONAL FEE ( 37 CFR 1.492 (a) (1) - (5) ) :</b> <div style="display: flex; justify-content: space-between;"> <div style="width: 60%;"> <input type="checkbox"/> Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO .....  <input checked="" type="checkbox"/> International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO .....  <input type="checkbox"/> International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO .....  <input type="checkbox"/> International preliminary examination fee (37 CFR 1.482) paid to USPTO but all claims did not satisfy provisions of PCT Article 33(1)-(4) .....  <input type="checkbox"/> International preliminary examination fee (37 CFR 1.482) paid to USPTO and all claims satisfied provisions of PCT Article 33(1)-(4) .....           </div> <div style="width: 35%; text-align: right;"> <b>\$1040.00</b>   <b>\$890.00</b>   <b>\$740.00</b>   <b>\$710.00</b>   <b>\$100.00</b> </div> </div> <div style="text-align: right; margin-top: 5px;"> <b>ENTER APPROPRIATE BASIC FEE AMOUNT =</b> </div>				<div style="border: 1px solid black; padding: 2px;"> <b>CALCULATIONS    PTO USE ONLY</b> </div>	
Surcharge of <b>\$130.00</b> for furnishing the oath or declaration later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492 (e))				<b>\$890.00</b>  <b>\$0.00</b>	
CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE		
Total claims	7 - 20 =	0	x \$18.00	<b>\$0.00</b>	
Independent claims	1 - 3 =	0	x \$84.00	<b>\$0.00</b>	
Multiple Dependent Claims (check if applicable) <input type="checkbox"/>				<b>\$0.00</b>	
<b>TOTAL OF ABOVE CALCULATIONS =</b>				<b>\$890.00</b>	
<input type="checkbox"/> Applicant claims small entity status. See 37 CFR 1.27). The fees indicated above are reduced by 1/2.				<b>\$0.00</b>	
<b>SUBTOTAL =</b>				<b>\$890.00</b>	
Processing fee of <b>\$130.00</b> for furnishing the English translation later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492 (f)).				<b>\$0.00</b>	
<b>TOTAL NATIONAL FEE =</b>				<b>\$890.00</b>	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31) (check if applicable). <input type="checkbox"/>				<b>\$0.00</b>	
<b>TOTAL FEES ENCLOSED =</b>				<b>\$890.00</b>	
				<b>Amount to be: refunded</b>	\$
				<b>charged</b>	\$
<div style="display: flex; justify-content: space-between;"> <div style="width: 60%;"> <p>a. <input checked="" type="checkbox"/> A check in the amount of <u>  <b>\$890.00</b>  </u> to cover the above fees is enclosed.</p> <p>b. <input type="checkbox"/> Please charge my Deposit Account No. _____ in the amount of _____ to cover the above fees. A duplicate copy of this sheet is enclosed.</p> <p>c. <input checked="" type="checkbox"/> The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. <u>  <b>15-0030</b>  </u>. A duplicate copy of this sheet is enclosed.</p> <p>d. <input type="checkbox"/> Fees are to be charged to a credit card. <b>WARNING:</b> Information on this form may become public. <b>Credit card information should not be included on this form.</b> Provide credit card information and authorization on PTO-2038.</p> </div> <div style="width: 35%; font-size: 0.9em;"> <p><b>NOTE:</b> Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.</p> <p>SEND ALL CORRESPONDENCE TO:</p> </div> </div>					
<div style="border: 1px solid black; padding: 5px;"> <p style="text-align: center; font-weight: bold;">Surinder Sachar</p> <p style="text-align: center; font-weight: bold;">Registration No. 34,423</p> <div style="text-align: center; margin-top: 20px;">   <div style="font-weight: bold; font-size: 1.2em;">22850</div> </div> </div>				<div style="border-bottom: 1px solid black; margin-bottom: 5px;"> </div> <p style="text-align: center;">SIGNATURE</p> <p style="text-align: center; font-weight: bold;">Marvin J. Spivak</p> <hr style="border: 0; border-top: 1px solid black; margin: 2px 0;"/> <p style="text-align: center;">NAME</p> <p style="text-align: center; font-weight: bold;">24,913</p> <hr style="border: 0; border-top: 1px solid black; margin: 2px 0;"/> <p style="text-align: center;">REGISTRATION NUMBER</p> <p style="text-align: center; font-weight: bold;">March 26 2002</p> <hr style="border: 0; border-top: 1px solid black; margin: 2px 0;"/> <p style="text-align: center;">DATE</p>	

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## DESCRIPTION

SYSTEM FOR DESIGNING VISUAL INFORMATION ON A MONITOR UNIT  
UTILIZED IN COMBINATION WITH A PROGRAMMABLE LOGIC CONTROLLER

### FIELD OF THE INVENTION

The present invention relates to a system for designing visual information on a monitor unit utilized in combination with a programmable logic controller (PLC).

### BACKGROUND ART

A monitor unit has been utilized in combination with a programmable logic controller (PLC) in order to monitor a task performed by I/O devices connected to and controlled by the PLC. The monitor unit includes a display for displaying visual information prepared for informing the task being performed, a controller section for controlling to display the visual information, and a memory for storing the visual information to be selectively reproduced on the display. In order to design the visual information, an image design tool is provided for creating a source display code of the visual information. After completing the design of the visual information on the tool, the source display code is transferred to the monitor unit where the source display code is translated into a corresponding bitmapped image for reproduction of the visual information on the display. Normally, the visual information created on the tool includes a combination of characters and graphic images. The characters are realized as vector fonts by the image design tool or draw program with the use of a font file provided on a computer running the draw program, while the graphic images are realized in a vector-oriented format defined by the program. Therefore, the monitor unit is

required to have additional character ROM for translating the characters into the corresponding bitmapped image as well as to have a capability of translating the graphic images in the vector-oriented format into the corresponding bitmapped image. The more the intended visual information becomes sophisticated with the inclusion of elaborate graphic images and the characters of different font sizes, the more the monitor unit is required to have the translation capability for rapid reproduction of the visual information on the display. To meet this requirement, the prior monitor unit has to incorporate a high speed CPU and a graphic processor, and therefore is realized at a considerably high cost.

#### DISCLOSURE OF THE INVENTION

In view of the above insufficiency, the present invention has been achieved to provide a system for designing visual information on a monitor unit which enables the use of the monitor unit manufactured at a reduced cost but assures rapid reproduction of the intended visual information. The monitor unit is utilized in combination with a programmable logic controller (PLC) for monitoring a task to be performed by I/O devices managed by the PLC. The PLC executes a program for controlling the I/O device connected to the PLC. The monitor unit includes a display, a controller section, and a memory. The system includes an image design tool operating on a personal computer for creating a source display code of the visual information to be reproduced on the display. The characterizing feature of the present invention resides in that the image design tool has a conversion means which translates the source display code into a corresponding bitmapped image and exports the bitmapped image to the monitor unit for immediate reproduction of the visual information on the display.

Consequently, the monitor unit can be dispensed with a costly component of translating the source image code into the bitmapped image, yet effecting rapid reproduction of the visual information on the display directly from the bitmapped image transferred from the image design tool.

Accordingly, it is a primary object of the present invention to provide a system for designing the visual information to be displayed on the monitor unit which allows the use of the less costly monitor unit but assures high speed reproduction of the visual information on the display.

In a preferred embodiment, the monitor unit is defined by a touch screen unit having a touch screen switch which generates a switch output to the PLC in response to a user's action of touching a particular area on the display. That is, the monitor unit, i.e., the touch screen unit is utilized in combination with the PLC also as an input terminal for entry of a specific instruction to be carried out by the PLC for control of the device managed by the PLC. In this connection, the image design tool includes a function of creating a switch control code for defining the switch output, and a transfer function of transferring the switch control code to the memory of the touch screen unit. The switch control code is processed by the controller section of the touch screen unit to associate the switch output to a particular function of the PLC for control of the devices connected to the PLC.

Preferably, the image design tool is programmed to transfer the source display code together with the bitmapped image thereof to the memory of the monitor unit. The image design tool is also programmed to have a retrieve function of retrieving the source display code as well as the switch control code back from the memory of the monitor unit for modification of the visual

information and the switch control code at the image design tool. That is, all the information or data displayed or processed by the monitor unit can be backed-up within the monitor unit to be accessible by the image design tool. Therefore, the modification of the visual information as well as the switch control code can be made without having to back up the data in another system, which is another object of the present invention.

Further, the present invention provides a scheme of rapid reproduction of a graphic image defined by a rectangular frame on the display. The rectangular frame is frequently utilized to be included in the visual information for highlighting a particular message written in the visual information. The image design tool gives a screen area for drawing the visual information therein. The screen area is divided into a plurality of unit zones extending in parallel with each other with each unit zone and having a length and a unit width defined by a fixed number of dots. The image design tool includes a means of drawing the rectangular frame which is written in the source display code and is translated into a corresponding bitmapped image for reproduction on the display. The image design tool is also equipped with a reshaping means of resizing the bitmapped image of the rectangular frame into a modified rectangular frame having a width equal to an integer multiple of the unit width, dividing the modified rectangular frame into one or more segments having the unit width, and transferring the one or more segments to the memory of the monitor unit or touch screen unit so as to be recombined on the display for reproduction of the bitmapped image of the modified bitmapped rectangular frame. Thus, the controller section of the monitor unit can be easy to perform a rapid reproduction of the modified rectangular frame on the display, which is a further object of the present

invention.

Preferably, the rectangular frame is defined as corresponding to a touch sensitive part of the touch screen switch for facilitating to prompt the entry of the instruction.

In a preferred embodiment, the image design tool has a capability of selecting a particular linguistic code from a set of different linguistic codes so as to create the visual information by using a string of characters according to the selected linguistic code. The tool also has a capability of including an identifier of identifying the selected linguistic code into the source display code such that, when the source display code is retrieved from the memory of the monitor unit into the image design tool, the string of the characters of the selected linguistic code is reproduced on the image design tool. Thus, the characters of any linguistic codes employed for the visual information can be successfully replicated at the image design tool without causing character garbling.

The memory of the monitor unit may be configured to include a virtual image area and an actual image area. The virtual image area has a size greater than a screen size given to the display and is provided for loading the bitmapped image to give a virtual image of the bitmapped image therein. The actual image area has a size equal to the screen size of the display and is provided for trimming the virtual image from the virtual image area into an actual image fitted in the screen size and stores the actual image. The actual image is then transferred by the CPU of the monitor unit to the display for reproduction of the visual information on the display. Thus, only the image within the screen size can be simply transferred from the memory without resorting to laborious procedure of checking over-reached portion of the image and making

proportional resizing of the entire image, thereby enabling immediate reproduction of the visual information on the display.

#### BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 shows a diagram showing a system for designing visual information on a monitor unit in accordance with a preferred embodiment of the present invention; FIGS. 2A to 2E are views showing different pages displayed on the monitor unit realized by a touch screen unit;

FIG. 3 is a schematic diagram showing a configuration of the touch screen unit;

FIG. 4 is a view explaining the transfer of data between an image design tool and the touch screen unit;

FIG. 5A illustrates one particular page which is designed to be displayed on the touch screen unit;

FIG. 5B is a view showing the content of data transferred from the image design tool to a memory of the touch screen unit;

FIG. 6A is a view showing rectangular switch frames included in an image created at the image design tool; and

FIGS. 6B to 6D show a scheme of resizing the rectangular switch frame in the image for easy handling at the touch screen unit.

#### BEST MODE FOR CARRYING OUT THE INVENTION

Referring now to FIG. 1, there is shown a system for designing visual information on a monitor unit **30** in accordance with the present invention. The monitor unit **30** is realized by a touch screen unit which is utilized in combination



with a programmable logic controller (PLC) **40** as a monitor of displaying information of a task being performed by I/O devices **50** managed by PLC **40** and also as an input terminal for entry of specific instructions to be carried out by PLC **40** for control of I/O devices **50**. PLC **40** executes its own program for control of the I/O devices **50**. For easy understanding of present invention, it is illustrated in the specification and drawings that PLC **40** manages the I/O devices **50** for continuous production of parts as one typical application of PLC **40**. The monitor unit **30** (hereinafter referred to as the touch screen unit) is therefore programmed to provide visual information associated with the production of the parts so that a user is informed of the status of the parts production as well as that the user is guided by the visual information to enter the specific instruction. The touch screen unit **30** includes a touch screen switch **33** (hereinafter referred to simply as touch switch) which provides switch outputs in accordance with the entry of the instructions for carrying out particular functions at PLC **40**.

In order to create the visual information and switch control code which is included in the visual information for allocating the switch outputs to the particular functions at PLC **40**, the system includes an image design tool **20**, i.e., a draw program which runs on a personal computer **10**. As shown in FIGS. 2A to 2D, the visual information to be created at the image design tool are classified into four pages, i.e., a top menu page **60**, a first selected page **61** for entry of intended production numbers of the parts, a second page **62** for entry of actions, and a third page **63** for display status of the operation.

As shown in FIG. 3, the touch screen unit **30** includes a controller section **31** including a CPU, a display **32**, the touch switch **33**, a memory **34**, and an interface **35**. The display **32** is in the form of a liquid crystal display (LCD)

having a screen and including a driver for reproduction of the visual information as bitmapped image on the screen by the controller section **31**. The touch switch **33** has an array of touch sensitive transparent areas covering the screen and each providing the switch output in response to being touched by the user. The memory **34** stores the visual information and the switch control code created by the image design tool **20**. The interface **35** is provided for transmission of the visual information and the switch control data between the memory **34** and the image design tool **20** and also for transmission of control data between the controller section **31** and PLC **40**.

The visual information created at the image design tool **20** is composed of base images **B** and rectangular switch frames **SF** overlayed on the base image. The base image is a background image appearing on each of the pages **60** to **63** and includes a string of characters and a graphic image such as a rectangular and a line. As shown in FIGS. 2A to 2D, the switch frames **SF**, which are provided at the pages **60** to **63** and illustrated with shadow lines, give user interface switches. In addition to drawing the switch frames, the image design tool has a function of determining switch actions of the switch frames. The switch actions includes, for example, switching of the pages on the display and designation the instruction to be transferred to PLC **40** for execution of particular routines of the program. In addition, the image design tool **20** sets an environment data **64** such as a screen size and a backlight screen color of the display **32**. As shown in FIG. 4, the visual information (page 0, page 1, page 2, and page 3) including the switch control code for each page as well as the environment data **64** are created at the image design tool **20** for transfer to the memory **34** of the touch sensor unit **30**. The visual information is created as a

source display code which is to be translated into a corresponding bitmapped image for reproduction of the visual information on the display **32**. Also, the switch control code is created as a source code which is translated at the controller section **31** into a suitable format to be executed thereat. Thus, each of pages **60** to **62** is defined by a combination of the source display code of the visual information and the source code of the switch control code.

Further, the image design tool **20** is programmed to have a conversion function of translating the source display code into the bitmapped image and exporting the bitmapped image as being attached to the source display code (page 0, page 1, page 2, and page 3) for each page, as shown in FIG. 4. The touch screen unit **30** operates to read the bitmapped image for immediate reproduction on the display **32** and to translate the switch control code for execution of the switch action. Also, the image design tool **20** is programmed to have a retrieve function of retrieving the source display code and the switch control code back from the memory **34** for modification of the visual information and the switch control code at the image design tool **20**.

Now more detailed explanation will be made as to the contents of the visual information with reference to FIGS. 5A and 5B. FIG. 5A shows the visual information of page **62**, while FIG. 5B shows the contents of the visual information of page **62** and the associated switch control code. The page **62** includes the base image with the strings of characters "Please Select" and "page 2" and the graphic line, i.e., the underline below the string "Please Select", and two rectangular switch frames **SF** labeled as "Continuous Operation" and "Stop" and defining the first and second switches, respectively. Each rectangular switch frame **SF** includes a graphic image of rectangular and a string of

characters "Continuous Operation" or "Stop", and has the switch control code embedded behind the rectangular frames. The characters for the base image as well as the switch frames are realized by vector fonts with the use of a font file equipped on the computer running the image design tool, while the graphic images for the base image as well as the switch frames are realized in vector-oriented format of the image design tool. The visual information thus including the characters and the graphic images for page **62** are translated at the image design tool **20** into the corresponding bitmapped image (BMP) which are appended to the source code of the visual information and the switch control code. That is, as shown in FIG. 5B, the data of page **62** is mainly composed of a page tag **71** specifying page **62**, bitmapped image (BMP) **72** of the base image, switch display data **81** of the first switch, switch display data **82** of the second switch, character data **73** for the characters of the base image, graphic data **74** for the graphic image of the base image, switch control code **91** of the first switch, and switch control code **92** of the second switch.

Each of the switch display data **81** and **82** includes a switch tag **83** specifying the corresponding switch, size information **84** defining the size of the corresponding switch frame, and bitmapped image (BMP) **85** of the corresponding switch frame. The character data **73** includes a character tag **75** specifying the character information, locating information **76** designating locations of the characters, font information **77** for fonts utilized for the characters, linguistic code information **78** specifying a particular linguistic code or a character set utilized for the characters, and character codes **79** defined by the linguistic code to represent the characters utilized. In this connection, the image design tool **20** has a capability of selecting a particular linguistic code from a set of different

linguistic codes so as to include the string of characters according to the selected linguistic code, and of including the selected linguistic code into the source display code. Whereby, when the source display code is retrieved from the memory **34** of the touch screen unit **30** to the image design tool **20**, the string of the characters of the selected linguistic code can be successfully reproduced on the image design tool **20**.

Each of the switch control code **91** and **92** includes a switch tag **93** specifying the switch control code, an effective range **94** in the display screen within which the switch is capable of being actuated, an operation mode **95** specifying the function of the switch, and a target designation **96** for specifying a target to be driven by the switch output. The function of the switch specified by the operation mode **95** includes making the switch as a momentarily actuated switch or alternately actuated bistable switch, for example, and also making the switch output as a command for changing the pages on the display **32**. When the operation mode **95** is set to make the switch output as the command for changing the pages, the target designation **96** specifies the page of the visual information. Otherwise, the target designation **96** specifies the device **50** to be controlled by PLC **40**.

Referring to FIGS. 6A to 6E, the present invention employs a unique scheme of resizing the bitmapped image for the rectangular switch frame into a suitable format and transferring the resized bitmapped image to the memory **34** of the touch screen unit **30** so that the controller section **31** can reproduce the bitmapped image on the display **32** at a high speed. When the visual information includes the rectangular switch frames **SF** as shown in FIG. 6A, the

image design tool **20** analyzes the size of the bitmapped image for the rectangular frame **SF** and resize the switch frame **SF** when transferring the bitmapped image to the touch screen unit **30**. The image design tool **20** provides a screen area **21** for drawing the visual information therein. The screen area **21** is divided into a plurality of elongated unit zones or bands **22** each having a unit width of eight (8) dots, as shown in FIG. 6A. When, for example, the switch frame **SF** labeled "Cancel" is made to have a width not corresponding to an integer multiple of the unit width, i.e., have the upper and lower sides of rectangular switch frame **SF** disposed between the borders of the bands **22**, as shown in FIG. 6B, the image design tool **20** adds extra blank spaces in the rectangular switch frame **SF** to such an extent that the upper and lower sides of the rectangular frame are in registration with the borders of the bands **22**. Thus, the rectangular switch frame **SF** is resized to have a width which is an integer multiple of the unit width, as indicated by the solid lines in FIG. 6C. The resized rectangular switch frame **SF** is divided into segments ①, ②, and ③ each having the unit width, as shown in FIG. 6D. Then, the resized rectangular switch frame **SF** is transferred in the form of the divided segments to the memory **34** of the touch screen unit **30**. In this manner, since the rectangular switch frame is resized so as to be divided into the segments of unit width, the controller section **31** of the touch screen unit **30** is capable of expanding the switch frame from the memory segment by segment and therefore assuring a high speed reproduction of the switch frame on the display **32** of the touch screen unit **30**.

The memory **34** is configured to have a basic memory area storing all the data transmitted from the image design tool **20**, and have additional areas,

namely, the virtual image area and an actual image area. The virtual image area has a size greater than a screen size of the display **32**, while the actual image area has a size equal to the screen size of the display **32**. In this connection, the screen area available at the image design tool **20** for drawing the visual information is made to have a size slightly greater than the screen size of the display **32** for giving design flexibility. The bitmapped image stored in the basic memory area is loaded to the virtual image area to give a virtual image of the bitmapped image. The virtual image is then loaded into the actual image area where it is trimmed into an actual image fitted in the screen size. Thereafter, the controller section **31** transfers the actual image to the display **32** for reproduction of the actual image thereat. In this manner, only the image within the screen size can be simply transferred from the memory without resorting to laborious procedure of checking over-reached portion of the image and making proportional resizing of the entire image, thereby enabling immediate reproduction of the visual information on the display only at an expense of canceling the over-reached portion around the virtual image.

Claims:

Amendment under Art. 34

1 (Amended). A system for designing visual information reproduced on a monitor unit utilized in combination with a programmable logic controller (PLC), said system comprising:

an image design tool operating on a personal computer; and

said monitor unit connected to said PLC which executes a program for controlling an operation of a device coupled to said PLC,

said monitor unit including a display, a memory, and a control section for controlling the operation of said monitor unit;

said display giving thereon task information to be performed by the device managed by the PLC, and including a touch screen for entry of a specific instruction to be carried out by the PLC for control of said device,

said image design tool creating a source display code for displaying said visual information on said display,

said image design tool being provided with a conversion means for translating said source display code into a corresponding bitmapped image and exporting said bitmapped image to the memory of said monitor unit for immediate reproduction of said visual information on said display,

said monitor unit being provided with a memory for storing the bitmapped image,

said image design tool having means for drawing a plurality of rectangular frames to be included in said visual information, each rectangular frame being written in said source display code which is translated by said conversion means into a corresponding bitmapped image for reproduction on said display, said



conversion means storing said bitmapped image for each said rectangular frame in said memory.

2. The system as set forth in claim 1, wherein

said monitor unit includes the touch screen switch on said display for generating a switch output to said PLC in response to a user's action of touching a particular area on said display,

said image design tool having a means of creating a switch control code for defining said switch output, and a transfer means of transferring said switch control code to the memory of said monitor unit, and

said control section of said monitor unit processing said switch control code stored in said memory in order to associate said switch output to a particular function of said PLC for control of said device connected to said PLC.

3 (Amended). The system as set forth in claim 2, wherein

said transfer means feeds said source display code to the memory of said touch screen unit,

said image design tool further including a retrieve means for retrieving said source display code and said switch control code back from said memory for modification of said visual information and said switch control code at said image design tool,

said image design tool transferring, to said memory, the source display code and the bitmapped image with regard to individual visual information to be

displayed on plural pages of said display, and

said retrieving means retrieving, from the memory, the source display code  
and the switch control code with regard to each of said pages.

4. The system as set forth in claim 1, wherein

said image design tool has a screen area for drawing said visual information therein, said screen area being divided into a plurality of unit zones extending in parallel with each other and having a length and a unit width defined by a fixed number of dots,

said image design tool having a means of drawing a rectangular frame to be included in said visual information, said rectangular frame being written in said source display code which is translated by said conversion means into a corresponding bitmapped image for reproduction on said display,

said image design tool having a reshaping means of resizing the bitmapped image of said rectangular frame into a modified rectangular frame having a width equal to an integer multiple of said unit width, dividing said modified rectangular frame into one or more segments each having the unit width, and transferring said one or more segments to the memory of said monitor unit so as to be recombined on said display to reproduce said modified rectangular frame.

5. The system as set forth in claim 2, wherein

said image design tool has a screen area for drawing said visual information

therein, said screen area being divided into a plurality of unit zones extending in parallel with each other and having a length and a unit width defined by a fixed number of dots,

said image design tool having a means of drawing a rectangular frame to be included in said visual information and of defining said rectangular frame as corresponding to a touch sensitive part said touch screen switch, said rectangular frame being written in said source display code which is translated by said conversion means into a corresponding bitmapped image for reproduction on said display,

said image design tool having a reshaping means of resizing the bitmapped image of said rectangular frame into a modified rectangular frame having a width equal to an integer multiple of said unit width, dividing said modified rectangular frame into one or more segments having the unit width, and transferring said one or more segments to the memory of said monitor unit so as to be recombined on said display to reproduce said modified rectangular frame.

6. The system as set forth in claim 1, wherein

said image design tool has capability of selecting a particular linguistic code from a set of different linguistic codes so as to create said visual information by using a string of characters according to the selected linguistic code, and of including an identifier of identifying the selected linguistic code into said source display code such that, when the source display code is retrieved from the memory of said monitor unit to said image design tool, the string of the characters of the selected linguistic code is reproduced on said image design tool.

7. The system as set forth in claim 1, wherein

the memory of said monitor unit comprises:

a virtual image area which has a size greater than a screen size given to said display and in which said bitmapped image is loaded to give a virtual image of said bitmapped image, and

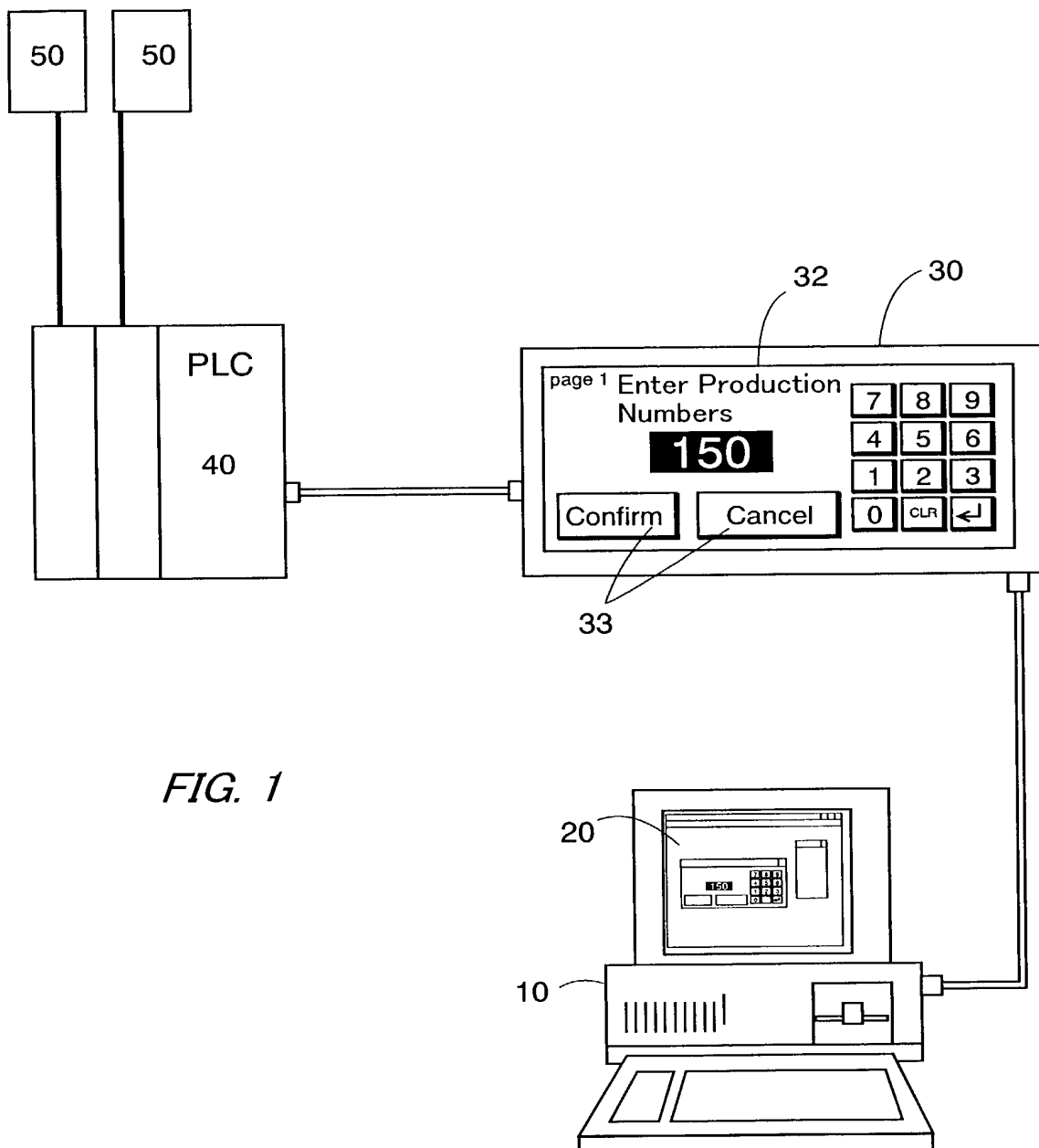
an actual image area which has a size equal to the screen size of said display and which trims said virtual image from said virtual image area into an actual image fitted in the screen size and stores said actual image;

said controller section of the monitor unit executing to transfer said actual image from said actual image area to said display.

### ABSTRACT

A system for designing visual information on a monitor unit which enables the use of the monitor unit manufactured at a reduced cost but assures rapid reproduction of the intended visual information. The monitor unit is utilized in combination with a programmable logic controller (PLC) for monitoring a task to be performed by I/O devices managed by the PLC. The monitor unit includes a display, a controller section, and a memory. The system includes an image design tool operating on a personal computer for creating a source display code of the visual information to be reproduced on the display. The image design tool has a conversion means which translates the source display code into a corresponding bitmapped image and exports the bitmapped image to the monitor unit for immediate reproduction of the visual information on the display. Consequently, the monitor unit can be dispensed with a costly component of translating the source image code into the bitmapped image, yet effecting rapid reproduction of the visual information on the display directly from the bitmapped image transferred from the image design tool.

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FIG. 2A

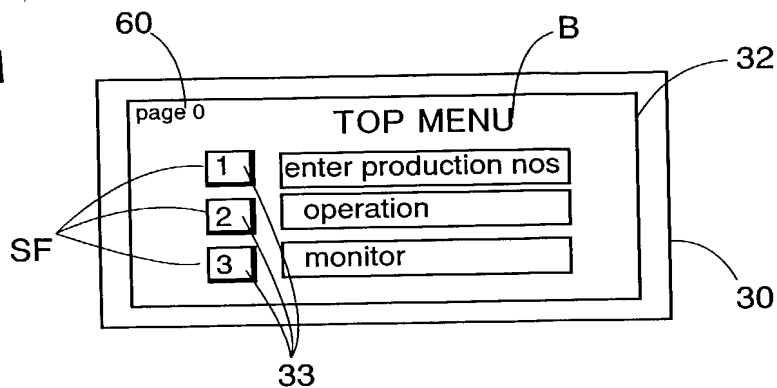


FIG. 2B

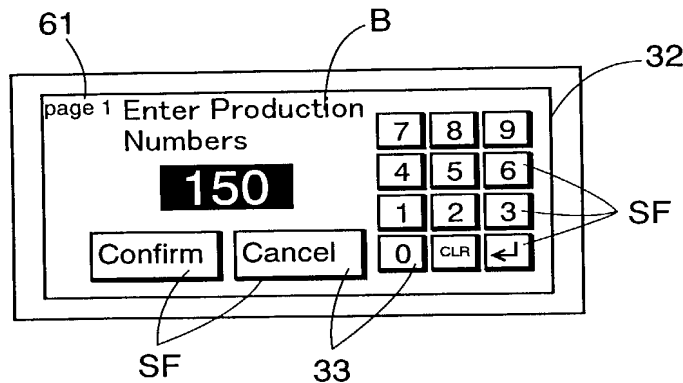


FIG. 2C

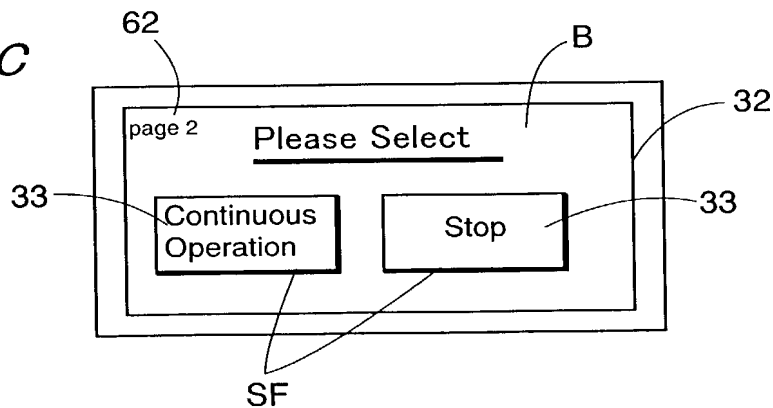
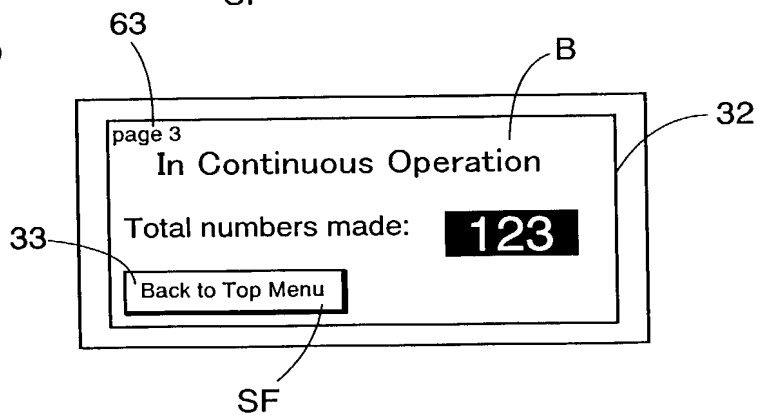


FIG. 2D



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FIG. 3

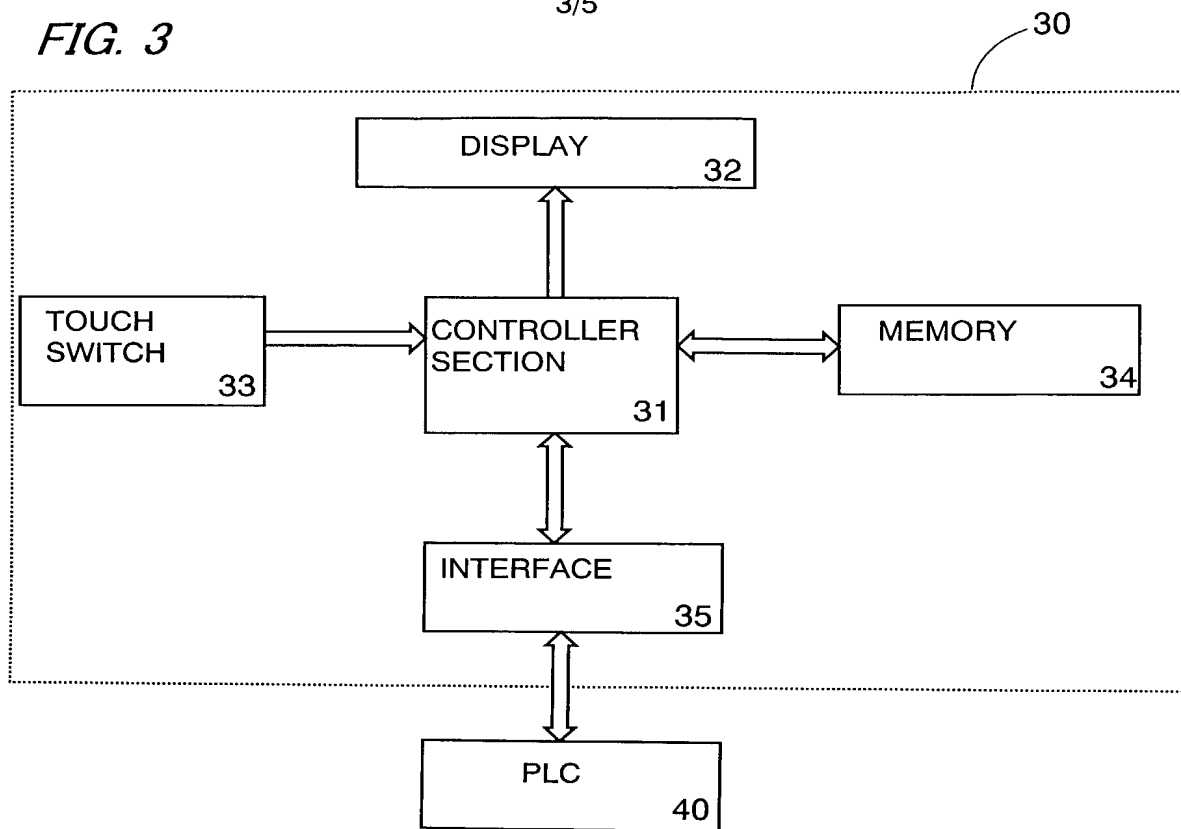
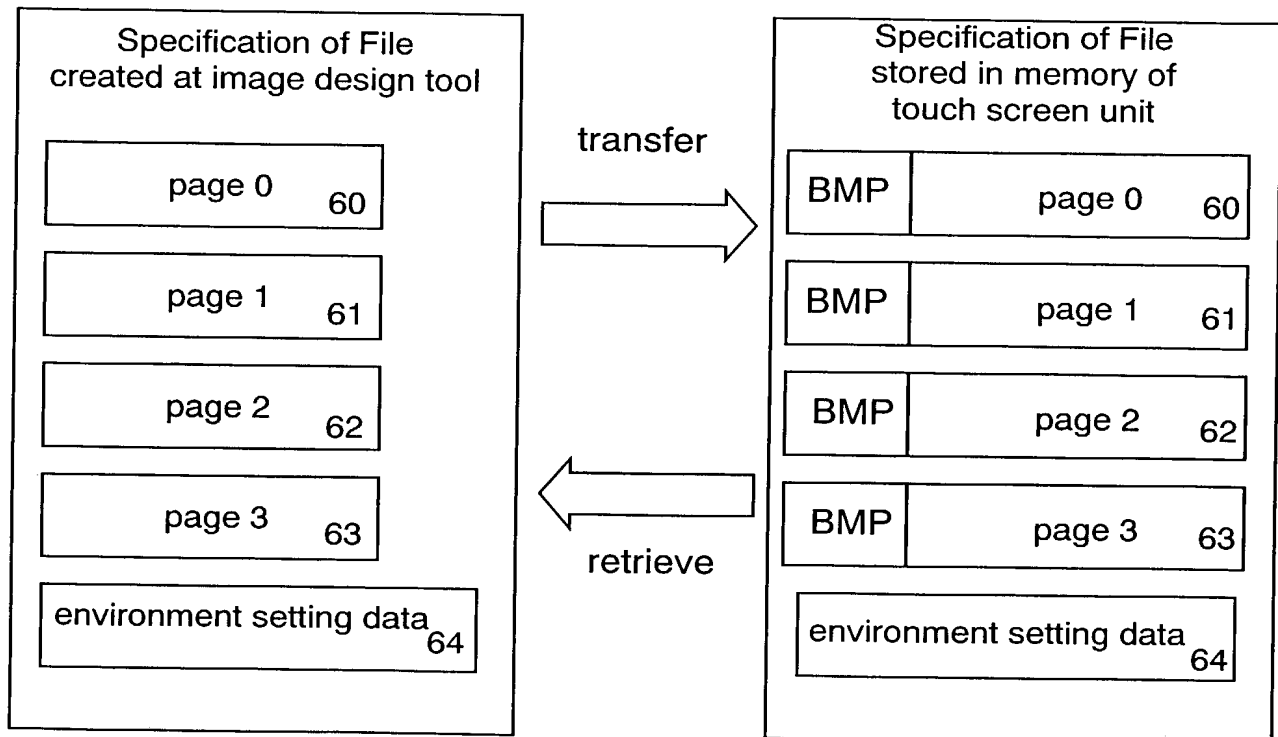
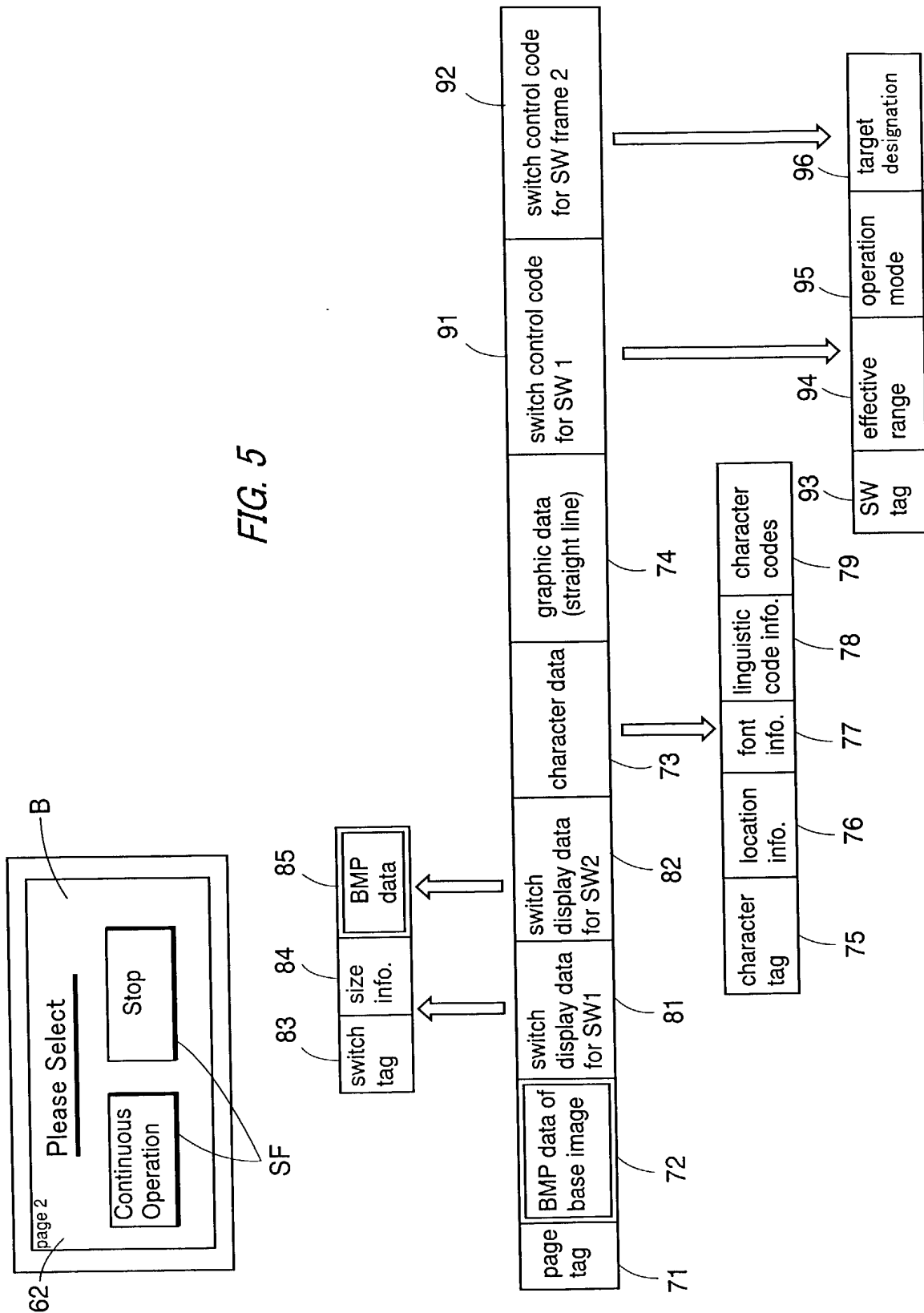


FIG. 4







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FIG. 6A

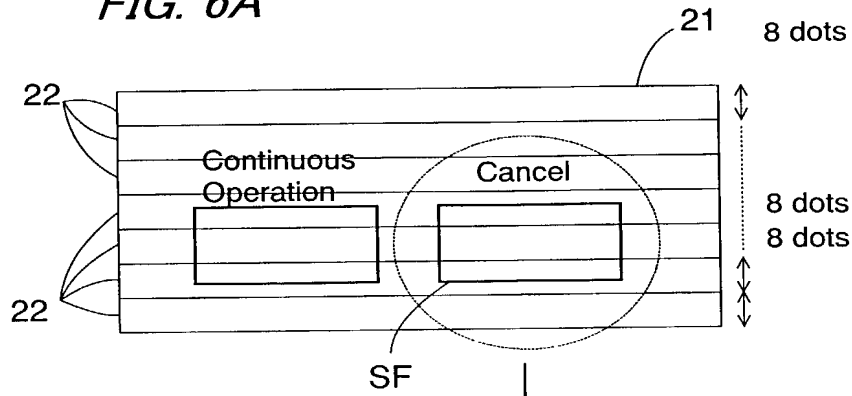


FIG. 6B

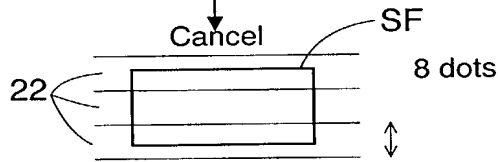


FIG. 6C

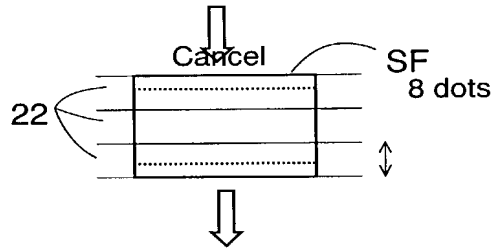
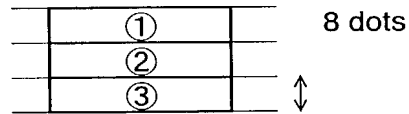


FIG. 6D



# Declaration and Power of Attorney For Patent Application

## 特許出願宣言書及び委任状

### Japanese Language Declaration

#### 日本語宣言書

下記の氏名の発明者として、私は以下の通り宣言します。

私の住所、私書箱、国籍は下記の私の氏名の後に記載された通りです。

下記の名称の発明に関して請求範囲に記載され、特許出願している発明内容について、私が最初かつ唯一の発明者（下記の氏名が一つの場合）もしくは最初かつ共同発明者（下記の名称が複数の場合）であると信じています。

上記発明の明細書は、

☐ 本書に添付されています。

☐ \_\_\_\_月\_\_\_\_日に提出され、米国出願番号または特許協定条約国際出願番号を\_\_\_\_とし、  
(該当する場合) \_\_\_\_に訂正されました。

私は、特許請求範囲を含む上記訂正後の明細書を検討し、内容を理解していることをここに表明します。

私は、連邦規則法典第37編第1条56項に定義されるとおり、特許資格の有無について重要な情報を開示する義務があることを認めます。

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled.

SYSTEM FOR DESIGNING VISUAL INFORMATION ON A MONITOR

UNIT UTILIZED IN COMBINATION WITH A PROGRAMMABLE

LOGIC CONTROLLER

the specification of which

☐ is attached hereto.

☒ was filed on September 28, 2000

as United States Application Number or

PCT International Application Number

PCT/JP00/06712 and was amended on

July 19, 2001 (if applicable).

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, Section 1.56.

Japanese Language Declaration  
(日本語宣言書)

私は、米国法典第35編119条 (a) - (d) 項又は365条 (b) 項に基づき下記の、米国以外の国の少なくとも一カ国を指定している特許協力条約365 (a) 項に基づく国際出願、又は外国での特許出願もしくは発明者証の出願についての外国優先権をここに主張するとともに、優先権を主張している、本出願の前に出願された特許または発明者証の外国出願を以下に、枠内をマークすることで、示しています。

Prior Foreign Application(s)  
外国での先行出願

11-280787

Japan

(Number)  
(番号)

(Country)  
(国名)

(Number)  
(番号)

(Country)  
(国名)

私は、第35編米国法典119条 (e) 項に基づいて下記の米国特許出願規定に記載された権利をここに主張いたします。

(Application No.)  
(出願番号)

(Filing Date)  
(出願日)

私は、下記の米国法典第35編120条に基づいて下記の米国特許出願に記載された権利、又は米国を指定している特許協力条約365条 (c) に基づく権利をここに主張します。また、本出願の各請求範囲の内容が米国法典第35編112条第1項又は特許協力条約で規定された方法で先行する米国特許出願に開示されていない限り、その先行米国出願書提出日以降で本出願書の日本国内または特許協力条約国際提出日までの期間中に入手された、連邦規則法典第37編1条56項で定義された特許資格の有無に関する重要な情報について開示義務があることを認識しています。

(Application No.)  
(出願番号)

(Filing Date)  
(出願日)

(Application No.)  
(出願番号)

(Filing Date)  
(出願日)

私は、私自信の知識に基づいて本宣言書中で私が行なう表明が真実であり、かつ私の入手した情報と私の信じることに基づく表明が全て真実であると信じていること、さらに故意になされた虚偽の表明及びそれと同等の行為は米国法典第18編第1001条に基づき、罰金または拘禁、もしくはその両方により処罰されること、そしてそのような故意による虚偽の声明を行なえば、出願した、又は既に許可された特許の有効性が失われることを認識し、よってここに上記のごとく宣誓を致します。

I hereby claim foreign priority under Title 35, United States Code, Section 119 (a)-(d) or 365(b) of any foreign application(s) for patent or inventor's certificate, or Section 365(a) of any PCT International application which designated at least one country other than the United States, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate, or PCT International application having a filing date before that of the application on which priority is claimed.

Priority Claimed  
優先権主張

30/09/1999

(Day/Month/Year Filed)  
(出願年月日)

☒ Yes  
はい

☐ No  
いいえ

(Day/Month/Year Filed)  
(出願年月日)

☐ Yes  
はい

☐ No  
いいえ

I hereby claim the benefit under Title 35, United States Code, Section 119(e) of any United States provisional application(s) listed below.

(Application No.)  
(出願番号)

(Filing Date)  
(出願日)

I hereby claim the benefit under Title 35, United States Code, Section 120 of any United States application(s), or Section 365(c) of any PCT International application designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of Title 35, United States Code Section 112, I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, Section 1.56 which became available between the filing date of the prior application and the national or PCT International filing date of application.

(Status: Patented, Pending, Abandoned)  
(現況: 特許許可済、係属中、放棄済)

(Status: Patented, Pending, Abandoned)  
(現況: 特許許可済、係属中、放棄済)

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Japanese Language Declaration  
(日本語宣言書)

委任状：私は下記の発明者として、本出願に関する一切の手続きを米特許商標局に対して遂行する弁理士または代理人として、下記の者を指名いたします。  
(弁護士、または代理人の指名及び登録番号を明記のこと)

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith: (list name and registration number)



022850

書類送付先

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(第三以降の共同発明者についても同様に記載し、署名すること)

(Supply similar information and signature for third and subsequent joint inventors.)

Japanese Language Declaration  
(日本語宣言書)

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(第六またはそれ以降の共同発明者に対しても同様な情報および署名を提供すること。)

(Supply similar information and signature for third and subsequent joint inventors )

# Japanese Language Declaration

(日本語宣言書)

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第五の共同発明者の氏名	Full name of <del>fifth</del> <sup>ninth</sup> joint inventor, if any <u>Teruma NISHII</u>
第五の共同発明者の署名	<del>Fifth</del> <sup>Ninth</sup> joint Inventor's signature <u>Teruma Nishii</u>
日付	Date <u>Jan. 28, 2002</u>
住所	Residence <u>Hirakata-shi, Japan</u>
国籍	Citizenship <u>Japanese</u>
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第六の共同発明者の氏名	Full name of sixth joint inventor, if any
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日付	Date
住所	Residence
国籍	Citizenship
郵便の宛先	Post Office Address

(第六またはそれ以降の共同発明者に対しても同様な情報および署名を提供すること。)

(Supply similar information and signature for third and subsequent joint inventors.)